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COMPLETE SPECIFICATION.

Improvements in or relating to Pipe and Tube Cleaners.

We, HERBERT NORRIS, British nationality, of 43 and 45 Pembroke Place, Liverpool 3, in the County of Lancaster, and WILLIAM NORMAN DEARN, British nationality, of 45 Childwall Abbey Road, Liverpool 16, aforesaid, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an expansible rotary brush or/and scraper or cutter tool to be actuated by a mandrel or flexible or other shaft, and primarily intended for the removal of deposits and scale from straight or curved ferrous and non-ferrous pipes or tubes—including those having extremely short radius bends—of, for example tubular boilers and other heat exchange equipment; although the tool may be utilized for cleaning or polishing of pipes and tubes generally. And our invention aims to provide such a brush or/and scraper or cutter tool which, whilst remaining continuously effective in use, shall be durable, and may be cheaply manufactured for the purpose intended.

Essentially, our expansible tool comprises a cylindrical body in the circumference whereof spaced longitudinal slots are formed or provided; brush or/and scraper or cutter elements or members located in said slots and capable of radial movement therein; and leaf springs adapted to urge continuously and independently said brush or/and scraper or cutter elements or members radially outwardly. Preferably, said brush or/and scraper or cutter members may also have capacity for rocking or angular movement when in use.

We will further describe our invention with the aid of the accompanying drawings which illustrate, by way of examples only and not

of limitation, three modes of embodiment.

In said drawings:—

Figs. 1 to 5, inclusive, show one form of carrying the invention into effect—brushes only being utilized;

Fig. 1 is a side view of the tool

Fig. 2 is a longitudinal section; and

Fig. 3 is a transverse section.

Fig. 4 is a view of one end; and

Fig. 5 is a view of the other end of the tool.

Fig. 6 is a transverse section of tool in which scraper or cutter blades (hereinafter, for convenience of description only, usually referred to as "scrapers") are substituted for the brushes of the tool of Figs. 1 to 5; and

Fig. 7 is a perspective view of a tool provided with both brushes and scrapers.

In the several views like characters of reference denote like parts.

The tool comprises a cylindrical body *a* in the circumference whereof—in this instance—three spaced longitudinal slots *b* are formed, said slots being parallel with the axis of the body and radially thereof. Extending from one end of said body *a* is a screw-threaded stem or stud portion *c* upon which is slidably mounted a cap *d* having an inward annular flange or skirt *d*¹. The other end of said body *a* is provided with a stem or stud portion *e* upon which is secured by riveting at *e*¹, a second cap component *f* with inward annular flange or skirt *f*¹. Said flanges or skirts of the end caps *d*, *d*¹ and *f*, *f*¹ engage stepped extremities *g* (Fig. 2) and so limit radial outward movement of renewable and exchangeable bristle carrier members *g* with brush bristles *g*¹ (usually, but not necessarily, steel) disposed in said longitudinal body slots *b*, and which, as will be apparent, are capable of both radial and rockable or angular movement within same. When cap *d*, *d*¹ is secured in position the cap

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portions *d, f*, constrain brushes *g, g¹* against longitudinal displacement.

In each slot *b* at the rear of its brush *g, g¹* is disposed a bow-shaped leaf spring *h* which is adapted to urge continuously its brush *g, g¹* (Figs. 1 to 5) outwardly as far as the stop flanges *d¹, f¹* permit.

A nut *j* is provided for temporary fitment on the screw-threaded stud portion *c* of body *a* to prevent backward displacement of cap *d, d¹*, i.e. until such time as the tool is required to be screwed on to rotating means which will hold the cap in position of use in a tube cleaning operation after said nut is removed. The bristles *g¹* of a brush *g, g¹* may be of steel, brass, or nylon, or any other suitable substance, according to the usage intended.

In cases where the deposit in a pipe or tube is too hard for removal by brushing, we may substitute for the brushes *g, g¹* scraper blades *k* (Fig. 6). Or scrapers *k* and brushes *g, g¹* (Fig. 7) may be utilized in a single holder to provide a dual purpose tool, so that both brushing and scraping of the interior of a pipe or tube may be effected simultaneously.

The tool, in use, is mounted at the end of a mandrel or a flexible or other shaft and driven from any suitable power source.

In an alternative embodiment of the invention, both ends of the tool body *a* may be provided with screw-threaded stem or stud extensions, said caps *d, d¹, f, f¹* being threaded appropriately for fitment thereonto. Or, screw-threaded stem extensions of the body may project sufficiently from both extremities thereof to permit of either end being screwed onto a drive shaft.

In modified constructions of tools under the invention a pilot cutter may be fitted to the nose of the brush or/and scraper assembly.

In experimental practice, it has been found that brush or/and scraper assemblies under our invention are—due primarily to the independent springing of the brush or/and scraper components—efficient and serviceable in use, in that they can readily accommodate themselves to varying shapes or configurations of pipes or tubes, and are especially resistant to wear. Further, by detachment of cap *d, d¹* the brushes or/and scrapers of the tool may be replaced easily by new or other forms of cleaning devices.

WHAT WE CLAIM IS:—

1. An expansible rotary pipe or tube cleaning tool, comprising a cylindrical body in the circumference whereof spaced longitudinal slots are formed or provided; brushes or/and scrapers located in said slots; and leaf springs adapted to urge continuously and independently said brushes or/and

scrapers outwardly for the purpose specified.

2. An expansible pipe or tube cleaning tool as claimed in the preceding claim, in which said leaf springs are bow-shaped.

3. An expansible rotary pipe or tube cleaning tool as claimed in either of the preceding claims, in which said brushes or/and scrapers are also capable of rocking or angular movement.

4. An expansible rotary pipe or tube cleaning tool as claimed in any preceding claim, in which end caps disposed on the tool body control the radial movement of the brushes or/and scrapers and also prevent unwanted longitudinal displacement thereof.

5. An expansible rotary pipe or tube cleaning tool as claimed in the preceding Claim 4, in which said end caps permit rocking or angular movement of the brushes or/and scrapers.

6. An expansible rotary pipe or tube cleaning tool as claimed in either of the preceding claims 4 or 5, in which stepped ends of said brushes or/and scrapers are engaged by inward flanges or skirts of said end caps.

7. An expansible rotary pipe or tube cleaning tool as claimed in any preceding Claim 4 to 6, inclusive, wherein one or both of said end caps is or are detachable from the tool body for the purpose specified.

8. An expansible rotary pipe or tube cleaning tool as claimed in any preceding claim, in which an end of said tool body is provided with a screw-threaded stem or stud and a brush or/and scraper confining cap is disposed thereon, said cap being adapted to be maintained temporarily in engagement with the brushes or/and scrapers by means of a nut removably screwed onto said stem or stud.

9. An expansible rotary pipe or tube cleaning tool as claimed in any preceding claim, in which the tool body is provided with a screw-threaded stem or stud at each end for the purpose specified.

10. An expansible rotary pipe or tube cleaning tool substantially as hereinbefore described and illustrated in Figs. 1 to 5 of the accompanying drawings.

11. An expansible rotary pipe or tube cleaning tool substantially as hereinbefore described and illustrated in Fig. 6 of the accompanying drawings.

12. An expansible rotary pipe or tube cleaning tool substantially as hereinbefore described and illustrated in Fig. 7 of the accompanying drawings.

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PROVISIONAL SPECIFICATION.

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We, HERBERT NORRIS, British nationality, of 43 and 45 Pembroke Place, Liverpool 3, in the County of Lancaster, and WILLIAM NORMAN DEARN, British nationality, of 45 Childwall Abbey Road, Liverpool 16, aforesaid, do hereby declare this invention to be described in the following statement:—

This invention relates to expansible rotary brushes and or scraper tools primarily intended for the removal of deposits and scale from straight or curved ferrous or non-ferrous pipes or tubes or pipes or tubes of any other suitable material—including those having extremely short radius bends—of, for example, tubular boilers and other heat exchange equipment, although our invention may be utilized for any tube cleaning or polishing operation; and aims to provide such a brush or and scraper tool, which whilst remaining continuously effective in use, shall be serviceable, and may be cheaply manufactured for the purpose intended.

According to the present invention, and in one mode of embodiment, the expansible brush comprises a cylindrical body in which spaced longitudinal slots, say, for example, three or more, are cut or otherwise provided: said slots are usually formed parallel with the axis of said cylindrical body and radially thereof. Extending from one end of said body is a screw-threaded rod or stud portion upon which is fitted a detachable cap or cap-washer or other closure, the flange or skirt whereof engages the extremities of (usually but not necessarily, steel) bristle-carrying members located in said longitudinal slots and which are capable of a certain amount of radial and rocking movement within same. The other end of said body is also provided with a stud portion upon which is fitted and riveted a second cap component adapted to confine the other extremities of the brush members. In said radial slots at the rear of each of said brush members is provided a substantially or bow-shaped leaf spring which is adapted to constantly urge the brush and/or scraper member outwardly. A nut is provided for

fitment to the screw-threaded stud portion of the body to hold the adjacent cap in position until such times as the brush assembly is screwed onto the end of a drive shaft or mandrel for use in a tube cleaning operation, when said nut may be removed. The bristles of the brush members may be of steel, or brass, or nylon, or any other suitable substance, according to circumstances; and in cases where the deposit in a pipe or tube is too hard for removal by brushing, we may fit cutter blades in said carrier member, in lieu of brushes; or both blades and brushes may be utilized together in one holder to provide a dual purpose tool, i.e. so that brushing and scraping may be effected simultaneously.

Said brushes may be mounted at the end of a mandrel or a flexible or other shaft, and be driven from any suitable power source.

In an alternative embodiment, both ends of the cylindrical body may be formed or provided with screw-threaded studs, and said end caps themselves may be appropriately screw-threaded for fitment thereto. Further, said screw-threaded stud portions of the body may project sufficiently from each end to permit of either end being screwed onto a drive shaft.

In some instances, coil or other suitably shaped springs may be substituted for the bow springs hereinbefore referred to.

We may, in some instances, fit a pilot cutter to the nose of the brush or/and cutter assembly.

In experimental practice, it has been found that brush and/or cutter assemblies under our invention are—due primarily to the independent springing of the brush and or scraper components—efficient in use in that they can accommodate themselves to varying tube shapes or configurations and are particularly resistant to wear.

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the Original on a reduced scale.

